Golf

A consideration of the game of golf is a uniquely curious idea. On the one hand we know that golf is played by the old and the young, the fat and the svelte, and by men and women. It is a game which can be played throughout life by a very diverse group. On the other hand, golf is a very difficult game to master. There are only a few hundred people who make a living playing golf among the several million people who play. The golf swing is an extremely complex motion whose analysis is beyond the scope of this curriculum or for that matter all but the highest level college physics class. Still, we are working at understanding sports not teaching it ,so the game of golf is, as they say, "fair game". The following questions should give us some understanding of what's up with golf:

- What are the big deals in the full swing?
- How can you tell if you are hitting the ball at the 'sweet spot'?
- Why does a golf ball need dimples?
- What is the effect of changing the clubface angle?

Question 1: *What are the big deals in the full swing?*

Introduction

Any one who has ever tried to learn to play golf can tell you that one of the hardest thing to do is craft a good full swing and reproduce that swing every time. We all the feelings of frustration that go along with trying to incorporate fifteen different body motions into one smooth swing. Among other things we are told to take dead aim, take a balanced stance, grip the club correctly, flex the knees, position the ball just so, take the club back low and slow, shift the weight from left t to right during the back swing, keep the left arm straight, get the back to the target, cock and then uncock the wrists, follow through, and throw the arms towards the target. For most of us this amount of instruction is just a little demanding; and I'm omitting a lot of other helpful tips. Yes the full swing of the club which results in a great true shot is indeed a rare thing. Let's try a little experiment in frustration by attempting some full swing golf.

Equipment Needed

1. Golf clubs
2. Balls
3. Driving range

Procedure

1. With a small amount of help from a golf coach have each student take a seven iron learn to grip it and try to swing it.
2. After being sure that the range is fairly deserted, have these novice golfers try swinging and hitting about ten balls each.
3. Score the efforts on the table below:

Hit # Direction of the ball went Yards the ball went Number of whiffs

4. Tally the score card for each player.

Analysis/ Questions

1. If the average distance of a well played seven iron is about 115 yard for a woman and 160 yards for a man, how did the students' efforts compare?
2. Was skill related to previous lessons and experience with golf?
3. Did most students consider this more or less difficult than they anticipated it would be?

Question 2: *How can you tell if you are hitting the ball at the 'sweet spot'*?

Introduction

Just like in baseball there is a place on the clubface of all golf clubs which minimizes the forces and vibrations which move up the shaft. When a ball is not hit on this spot the club shaft has a force put on it which tends to turn the clubface slightly inside or outside. When the clubface turns the ball is projected left or right instead of straight down the intend line of flight. So it=s critical to try to hit the ball at the sweet spot. On most clubs this position is marked in some way. For all clubs it is roughly at the center of the clubface. How can you determine easily if you are doing this correctly? A simple procedure can be instructive.

Equipment Needed

1. Golf clubs
2. Balls
3. Tempura paints
4. Small paint brushes
5. Small bucket of water and rags

Procedure

1. Put a small dab of paint on the back of a ball and place it so that the dab is facing towards and centered on the club impact area.
2. Address the ball and swing normally.
3. Examine the clubface to see where the paint is. This is where the clubface met the back center of the ball.
4. Have each student take several swings and tally the contact point on the table below.

Hit#	Position of contact (left or right of center)	Direction ball went

Analysis/ Questions

1. Define the relationship between ball contact position and ball direction after contact.
2. How did it feel to hit the ball at the center of the clubface?
3. Describe the trajectory of a ball hit at the sweet spot.

Question 3: *Why does a golf ball need dimples?*

Introduction

Close examination of a golf ball shows that it is not at all a smooth, round ball. In fact all golf balls today have "dimples"- small geometric indentations- all over the ball. These indentations were not always on the ball. The real golf balls were called "featheries". They were made by stitching hide into a ball shape with a small opening. Wet feathers were stuffed into the ball until it was very full then the hide was closed with small tiny stitches. After drying out the ball was very hard and could be used for play. This kind of ball was replace by ball molded out of a substance called gutta percha. These balls were at first perfectly smooth and didn't fly too well. Soon golfers were noting that the balls actually flew better as they got scratched up. After more investigation the "dimple" was born. Modern balls always have some version of the dimple. Let's do an experiment to prove that dimples are really needed.

Equipment Needed

1. Balls which have been sanded to remove the dimples then varnished several times to smooth the surface
2. Regular balls
3. Distance markers
4. Seven iron
5. Driving range

Procedure

1. Have a competent (or at least semi-competent) player strike several balls both normal and altered.
2. Mark the progress of each ball.

Analysis/ Questions

1. What differences did you notice between the dimpled balls and the smooth balls?
2. Do a little research and discover why the flight of the ball is changed by removing the dimples.

Question 4: *What is the effect of changing the clubface angle?*

Introduction

Contrary to popular opinion, golf is not simply about how far you can hit the ball. As you approach the green accuracy becomes a bigger and bigger issue. To facilitate the finesse part of the game a set of golf clubs contains clubs of several lengths and face angles. For

example, a driver whose job is to hit a long distance shot has a very nearly square clubface. As the number associated with the club, for both woods and irons, gets higher, the clubface angle gets larger as measured off the perpendicular. The change in the clubface angle is also related to the distance the ball will go with a uniform swing. A simple exploration will show the relationship.

Equipment Needed

1. Set of irons
2. Protractor
3. Balls
4. Distance markers

Procedure

1. Use the protractor to measure the angle of the clubface of each of the irons.
2. Have a competent player hit several balls with each of the clubs.
3. Mark the distance attained for each shot and figure out the average distance for each club.
4. Observe the trajectory for each club.

Analysis/ Questions

1. What relationship could you identify between average distance and club number/ angle?
2. How large was the standard deviation in the distance hit for each of the clubs?
3. What did you note about the club trajectory and the average distance of travel?